

Assessment of the Distribution of Enset Bacterial Wilt Disease (Xanthomonas Campestris Pv.Musacearum) in South Omo zone, Southern Ethiopia

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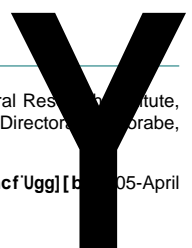
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Enset bacterial wilt (EBW) caused by *Xanthomonas campestris* pv. *Musacearum* is one of the most serious diseases in enset growing areas of Ethiopia. There were no documented reports on the distribution of enset bacterial wilt in South Omo zone. Therefore, the objectives were to determine the prevalence and incidence of EBW. The study was carried out during 2017/2018. South Ari and North Ari districts were purposely selected based on enset production. Nine and ten kebeles were randomly selected from each district. In each kebele, ten suckers were randomly selected from each of mass grown suckers. The survey result revealed that the disease was detected in both districts and all kebeles but in varying extent. At district level, the higher disease prevalence (65%) and incidence (6.85%) were recorded in North Ari, while the lower prevalence (40%) and incidence (2.73%) were observed in South Ari district. At kebele level, the prevalence varied from 10% to 90%, while incidence 1.21% to 15.46% in Komer and Kalet kebeles, respectively.

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(based on the number of cycles used).

(2)

Data analysis

The incidence and prevalence of EBW data which is obtained from field surveys were analyzed by using the simple descriptive statistics after being entered in SPSS computer program version 23.0 for windows. Summary of wilt incidence and prevalence were presented for each independent variable and variable classes in tables and graphs.

The association of EBW incidence and incidence at cycle 3 with independent variables was analyzed using logistic regression with SAS Software. The wilt incidence and wilt incidence at cycle 3 were classified into distinct groups of binomial qualitative data. Thus, 5 and >5% were chosen for wilt incidence yielding a binary dependant variable. Class boundaries of 10 and >10% were chosen for incidence at cycle 3.

Result and Discussion

General features of the surveyed fields

Enset clones have different vernacular names in study areas. Farmers differentiate one clone from the other by morphological characters

enset producing areas in the zone and EBW disease is most important farming communities issue in the areas. For the ease of this research work, agro-ecologies were categorized into three altitudinal ranges (groups), namely lowland (Kolla) with below 1,830 m.a.s.l, midland (Woinadega) with 1,830- 2,440 and highland (Dega) with above 2,440 m.a.s.l. Nine and six representative kebeles in South Ari and North Ari districts respectively were selected based on number of kebeles in each district. The kebeles were selected purposively by consulting district experts based on road accessibility, agro-ecologies (Kolla, Woinadega and Dega) and enset production status. Ten enset fields were randomly selected and disease data were collected from each kebele at a distance of 1-2km based on enset availability. Accordingly, a total of 150 enset fields were assessed in the course of survey. Disease assessment in farms was performed with a simple random sampling technique by two diagonal walking (in "X" fashion) in a sampling area of 200m² (20m*10m) and 50m²(10m*5m) for cycle 3 and 2, respectively. The number of samples from each farm observed were three to five for cycle 3 and one to three for cycle 2 depending on the size of the farm. For cycle 1, ten suckers were randomly selected from each of mass grown suckers propagated from corm.

Primary and secondary data were used during survey. Primary data collection was done through direct field observation and interview with farmers and key informants. Secondary data were obtained from zone and districts Agriculture Offices.

Assessment of bacterial wilt of enset

In each field, the enset plants were grouped into three cycles based on growth stages. Based on this, Cycle 1 was the sucker stage, which was produced from a single corm; cycle 2 was two years old which was transplanted from cycle one, cycle 3 was three years to harvesting (maturity) stage. In each cycle, the total number of plants and the number of plants showing typical bacterial wilt symptoms was recorded through direct field observations. Disease incidence and disease prevalence were calculated using the following formula.

$$\text{Disease incidence (\%)} = \frac{\text{Number of diseased plants}}{\text{Total No of plants examined}} \times 100 \quad (1)$$

Average wilt incidence for the field was obtained by summing up the percentage wilt incidence for each cycle divided by two or three

and field bean were commonly mixed cropping plants with lower cycles in high lands. On the other hand, avocado, banana, coffee, taro and cardamom were commonly mixed cropping plants with cycle three in low and mid land altitudes.

Enset production in South Omo zone had three cycles with two transplantations. Cycle 1 is the sucker stage, which is developed from a single corm and it takes at least one year to be transplanted to next stage called cycle 2. Cycle 2 is transplanting stage which is transplanted from Cycle 1 and allowed to grow for one or more years depending on management, soil fertility status and vigorous of the sucker. In this zone, farmers practiced planting of 5 to 10 suckers together per hole in cycle 2 and transplant the vigorous suckers into Cycle 3 in the next season. Cycle 3 is the final stage which is planted at permanent farm as long as maturity or ready to harvesting. In this zone farmers not practiced the planting of enset plants by using rows and recommended plant spacing. Planting of enset plants over crowdedly was more common during survey.

The survey results indicated that bacterial wilt of enset was widely distributed and a very serious problem in all the surveyed areas. However, it varies across agro ecologies, locations and farming system. The farmers were asked if the disease was occurred in their field previously (Table 2) and from interviewed farmers, 60.7% of them responded that the disease existed in their fields previously. The farmers were also asked if they knew any resistant enset clone and about 96.7% of them answered that no resistant clone exists while 3.3% of them knew the presence of some relatively resistant clones (Table 2). At the time of survey farmers were interviewed about alternative hosts of bacterial wilt other than enset and banana. They responded that taro crop is an alternative host for the disease.

Assessment of prevalence and incidence of enset bacterial wilt

The distribution of the bacterial wilt varied within assessed kebeles. 50% of enset fields were affected by the disease. It was most prevalent in North Ari district with 65% prevalence (Table 3). The disease was found in all surveyed kebeles with disease prevalence ranging from 10 to 90%. The highest (90%) EBW prevalence was recorded in Kalet kebele followed by Aymatol kebele with 70% disease prevalence. Whereas, the lowest EBW prevalence (10%) was recorded in Komer kebele.

The incidence and prevalence of bacterial wilt varied for different variables and variable classes (Table 3). The overall mean incidence of the disease was 4.38%. About 6.85% and 2.73% mean EBW incidence were recorded in North Ari and South Ari woreda districts, respectively. Among surveyed kebeles, the least affected kebele was Komer with mean incidence of 1.21%. Likewise, the highest mean incidence (15.46%) was recorded in Kalet kebele. Enset fields showed various level of EBW infection with crop losses ranging from 0-100% on some sampled enset fields in West Shewa, Ethiopia.

The distribution of the diseases varied across altitudes. High disease prevalence (60%) was recorded at altitude range of 1830-2440 masl followed by >2440 and <1830 masl, which had EBW prevalence of 57.5% and 32%, respectively (Table 4). The ending of the present

and incidence of 15.46% and least destructive in Komer kebele with prevalence of 10% and incidence of 1.21%.

The current survey results showed that the disease is widely distributed in surveyed areas. Different studies recommended use of